

flours, and that the former constituent attains its maximum in F, the coarse sharps, and the latter in I, the long bran. In K and L both nitrogen and ash are lower, these products containing much cellulose, made up as they are in great measure of the three coats which form the pericarp of the grain. But it must not be forgotten that all the mill-products included under "bran" contain much more cellulose than is present in flour, namely:—from 7 to 15 per cent., or even more, in lieu of 1 per cent., or less. And it would appear that while flour contains more than 90 per cent. of its nitrogen in the form of true albuminoids or flesh-formers, in some of the brans one-third of their nitrogen is in the form of non-albuminous bodies, of no recognised value as nutrients.

We have now to secure but one more datum before we proceed to the determination of the main question before us. How much flour and how much bran will 100 parts of ordinary soft wheat yield on the ordinary system of low-milling adopted in England? As the averages from an immense number of independent estimates we may put down the flour at a total of 80, the bran at 17, and the loss at 3. Thus, from an economical point of view, we appear to lose $\frac{1}{5}$, or twenty per cent. of our wheat by submitting it to the numerous treatments involved in the manufacture of flour. But is this really the case? We think not. For much of the nitrogen in the rejected parts is not in the form of flesh-forming matter, and much that does so exists in the bran passes unaltered and unused through the alimentary canal, because of its close incorporation with fibre. But on the other side we must not forget that bone-forming materials are clearly deficient in wheaten flour, and that those phosphatic compounds present in bran are readily soluble to a large extent, not only in the several digestive secretions with which they come in contact in the body, but also in pure water.

But in comparing and contrasting bread made from flour with that made from whole wheat we must consider other points. We shall find it impossible to make, by means of leaven or yeast, a light spongy loaf from whole wheat finely ground, the so-called *cerealine* of the bran inducing chemical changes which result in a moist, clammy, dense product. Even whole wheat merely crushed into meal, and not ground, partakes of the same defect. Fine flour, on the other hand, yields a bread which is light enough before mastication, but which, when masticated, possesses a marked tendency to become compacted into dense lumps which may never become penetrated by the gastric and intestinal juices, and which are a frequent cause of constipation. Whole meal bread cannot be charged with this defect; indeed it acts medicinally as a laxative, and by reason of its mechanical texture is hurried rather too quickly along the digestive tract, so that the full virtue of such of its nutrients as are really soluble becomes in part lost. Yet there is no doubt that for many persons, especially those who have passed middle age and are engaged in sedentary occupations, whole wheaten meal in the form of bread, biscuits, scones, &c., forms an invaluable diet.

The following analyses may present some of the foregoing statements in a clearer light and may add some additional particulars of interest. They represent, so far as a couple of sets of average results can do so, the percentage composition of ordinary white bread and of the whole meal bread made by Messrs. Hill and Son:—

	White.	Whole Meal.
Water	40·0	43·5
1 Albuminoids or flesh-formers	7·0	210·5
Starch, dextrin, and sugar ...	50·7	40·6
Oil and fat	0·6	1·6
Cellulose and lignose	0·5	1·8
3 Ash or mineral matter	1·2	2·0

2 Calculated from total nitrogen present.

3 As much as 12·5 in some samples.

3 Includes common salt added.

It is clear from the above figures that if we could reckon the whole of the nitrogenous matter in whole meal bread as equally effective with that contained in white bread, we should possess in the former a far more perfectly adjusted food; for the ratio of flesh-formers to heat-givers is about 1 to 7½ in white bread, while it approaches 1 to 4 in some samples, at least, of whole meal bread. Add to this the higher proportion of phosphates in the latter, and its *chemical* superiority over white bread becomes still more marked: its flavour, too, is far richer.

One word as to ordinary brown bread will suffice. It is a poor preparation at the best. By adding a dash of rather rough bran to flour we do not obtain a satisfactory or rich product: analysis demonstrates this fact clearly.

We cannot leave this subject without referring to the little pamphlet which Messrs. Hill and Son have recently issued,¹ on the subject of wheaten meal. Though its main purpose is necessarily a commercial one, it presents many interesting and important facts in a readable form. Messrs. Hill have certainly brought their specialty in bread making some way on the road to perfection. With a few of the opinions in their little *brochure* we cannot, however, wholly concur; nor do we see how their assertion can be maintained that the present system of white bread making involves the loss of 50 to 60 per cent. of the wheat devoted to that purpose.

The limited space at our command must be our excuse for the very imperfect treatment here adopted of the wide subject before us.

A. H. CHURCH

THE LAND OF BOLIVAR AND ITS PRODUCTS²

VENEZUELA, or the Land of Bolivar, as Mr. Spence prefers to call it, has certainly received less attention from European travellers than many other less attractive and more explored parts of South America. The Andean ranges of the north and the llanos of the south of the republic alike merit attention, and now that mining enterprise has opened up several parts of the country and tinged it with European civilisation, we know of no more come-at-able country to which the naturalist could turn his steps. Certain it is that he would find ample materials for investigation, and reap a good harvest of novelties in either fauna or flora.

Mr. Spence's main object in visiting Venezuela was, as it appears, the obtaining of a concession of the privilege of working certain deposits of mineral phosphates in the Roques Islands on the northern coast of the republic. During the eighteen months occupied by the delicate negotiations required for this purpose Mr. Spence seems to have lost no time. Although nominally resident at Caracas, in order to be in immediate communication with the ministers, frequent excursions were made to the most interesting of the surrounding districts. The coal mines of Nueva Barcelona, the Lake of Valencia, and the group of islands which were the seat of the wished-for concession, besides other localities of interest, were visited and explored. But the ascents of the Silla of Caracas and the still higher peak of Naiguatá, the crowning point of the Andean range between Caracas and the coast, appears to have been the principal expeditions to which Mr. Spence devoted his attention. The first

¹ "The Whole Meal Bread Question." By W. Hill and Son, Bishops-gate Street.

² "The Land of Bolivar: or, War, Peace, and Adventure in the Republic of Venezuela." By James Mudie Spence, F.R.C.S. 2 vols. 8vo. (London, 1878.)

"Estudios sobre la Flora y Fauna de Venezuela." Por A. Ernst. 4to. (Caracas, 1877.)

"Estudios sobre las deformaciones, enfermedades y enemigos del Arbol de Cafe en Venezuela." Por A. Ernst. (Caracas, 1878.)

"On Venezuelan Birds Collected by Mr. A. Goering." By P. L. Slater, M.A., F.R.S., and Osbert Salvin, M.A., F.R.S. (*Proceedings of the Zoological Society of London*, 1868-75. Five articles.)

recorded ascent of the Silla was made by Humboldt at the beginning of the present century, since when it has been climbed by several enterprising Venezuelans and by some foreign visitors. Mr. Spence effected the ascent in April, 1872, in company with the German naturalist, Goering, who was at that time collecting in Venezuela, and several private friends. The Silla having been successfully stormed, the summit of Naiguatá, which rises about 800 feet higher, was the next object. From the Silla, Mr. Spence tells us, this high peak "rose boldly to view, and the walled-in appearance of its flanks provoked not only curiosity, but an enthusiastic desire to overcome its traditional difficulty of ascent." Now Naiguatá was reputed to be inaccessible; there was a firm belief in Caracas that its summit "would never be trodden by human foot." There was even an old tradition which "proclaimed its impregnability," and all those who had attempted to scale the height had been compelled to abandon the undertaking without success.

Nothing daunted by the objections of the good people of Caracas, Mr. Spence and his friends set out on their expedition on April 21, 1872, and arrived, after some little difficulty, at the desired summit about midday next day. The Grand Precipice (see our illustration, Fig. 1) would not perhaps appear very formidable to an Alpine-clubbist, but under the tropics people are not so active or so venturesome as in these cold climes, and the retreat was rendered rather severe from the want of water, and the fog which rose up in the evening and obscured the way, as shown in Mr. Spence's drawing (Fig. 2). However, the deed was done, and amongst a small collection of Alpine plants brought from the summit, which has been since described by Dr. Ernst in the *Journal of Botany*,¹ was a new species of bamboo, named, after its discoverer, *Chusquea spencei*, in commemoration of the occasion.

Besides the account of his various expeditions and of his life at Caracas, many miscellaneous subjects regarding

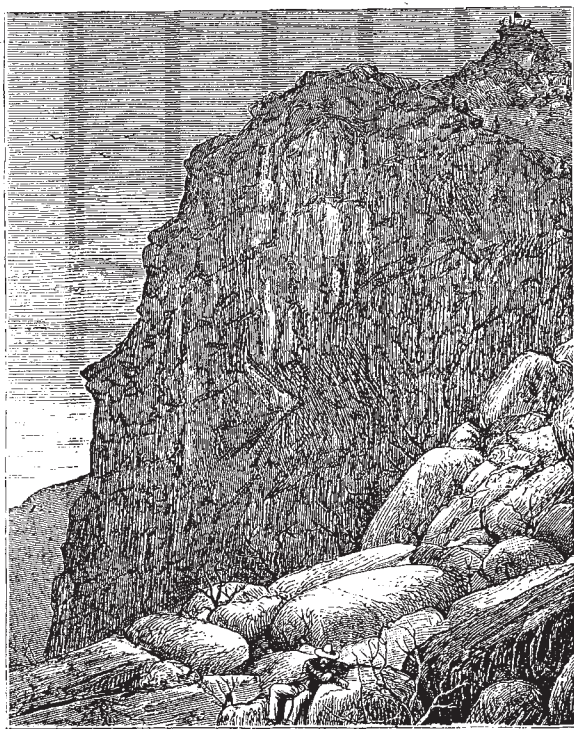


FIG. 1.—The Grand Precipice of Naiguatá.

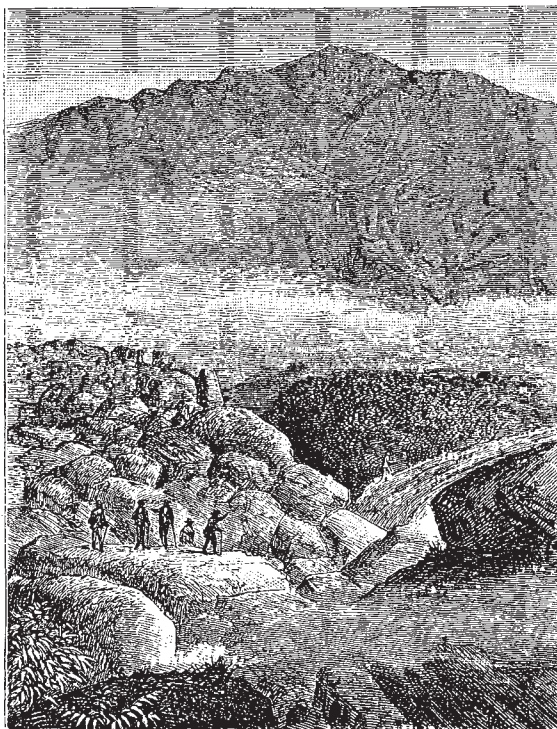


FIG. 2.—The Way lost on Naiguatá.

the "land of Bolívar" are treated of in Mr. Spence's volumes, and the appendix contains other details, amongst which is a synopsis of the orchids hitherto met with within the confines of the republic from the pen of Dr. Ernst. On the whole we may pronounce that Mr. Spence has done well in bringing the merits of a little-known part of the world's surface before the European public. Could Venezuela be persuaded to keep free from intestine dissensions, and to pay her debts a little more regularly, she might still make a figure among the American republics.

Along with Mr. Spence's volume two memoirs of Dr. Ernst, whose name we have already mentioned, lie before us. Dr. Adolf Ernst is, as his name betrays, a German who has deserted the Fatherland for Caracas, and is there labouring to grow science upon a somewhat uncongenial soil. In botany, zoology, and ethnology alike he has worked hard, and is the founder of the "Sociedad de Ciencias Físicas y Naturales de Caracas," and, we

believe we may add, the writer of the greater part of the memoirs of that learned association. His first "Estudios" contains general essays on the flora and fauna, and special catalogues of the ferns, orchids, birds, and land-molluscs of the republic. The second "Estudios" are devoted to a subject of primary importance in Venezuela, that is, to the maladies and enemies (animal and vegetable) of the coffee-plant—one of the staple-products of that part of America. This appears to have been written in answer to an appeal, from the scientific society above-mentioned, for the best essay on this absorbing question, and received the prize to which it was, no doubt, entitled, as having been written by probably the only individual in Venezuela who had more than empirical knowledge of the subject.

Finally we may remark that there is at least one

¹ "Notes on a Small Collection of Alpine Plants from the Summit of Naiguatá, in the Mountains of Caracas." By A. Ernst, Ph.D., &c. (*Jour. Bot.*, September, 1872.)

branch of the fauna of Venezuela that appears to have been pretty thoroughly worked at. Herr Anton Goering—the German naturalist, whose name has been already mentioned in connection with the ascent of the Silla of Caracas—sent all his collections of birds to this country, where they were examined and reported upon by two competent naturalists, who have devoted special attention to the neotropical avifauna. The results are given in the series of papers read before the Zoological Society of London, of which the titles stand last in our list of the subjects of this notice.

Mr. Goering's principal discoveries in the class of birds were made in the Andes of Merida, where some splendid novelties were obtained. And in this part of Venezuela, if we mistake not, there remains most to be done as regards both the fauna and the flora of the republic.

THE FISHERIES OF BRITISH NORTH AMERICA¹

II.

THE careful inquiries that have been recently carried on by various able investigators in regard to the habits of our chief food-fishes—the Cod, the Herring, and the Mackerel—have now finally disposed of a large accumulation of popular fallacies on the subject of their migrations. On the European side Dr. G. O. Sars has added most to our scientific knowledge of the subject; and on the American, the United States Fisheries' Commissioner, Prof. Spencer Baird, and Mr. Hind, of the Halifax Fishery Commission, whose reports furnish a most valuable body of information as to the New England and Dominion fisheries.

It may now be affirmed with certainty that the notion of the long and distant migrations of these food-fishes is a complete mistake: the real facts being that they never range to any great distance from their ordinary *habitats*; that their migrations, which have reference to food on the one hand and to the deposit of spawn on the other, are simply from deep to coastal waters, and back again; and that these migrations are chiefly dominated by temperature.

Commencing with the *Cod*, we are informed by Mr. Hind that the total average weight caught in North American waters is about 185,000 tons, representing from 150 to 175 millions of fish, or between three and four times the produce of the whole Norwegian cod-fishery. Of this, the portion caught in the waters of the United States is only about one-fifth. "Winter cod" are taken on the southern coast of Newfoundland through the whole winter, while "summer cod" are captured through the summer months on the north-east shores of Newfoundland, the entire shore of the Gulf of St. Lawrence, and along the Labrador coast as far north as the Moravian missionary stations, Nain and Okak (57½° N. lat.).

It seems now well established that the great body of cod-fish inhabiting the waters of the long North American seaboard is divided into numerous separate "schools," which vary in their habits according to the localities they respectively frequent, each keeping (for the most part, at least) within its own limited range. There is no specific or even varietal difference between the "winter" and "summer" cod; their movements towards the coast from the neighbouring deeps, in which they spend the remainder of the year, being determined by the climatic changes which make the northern shores afford the temperature most congenial to the species in the summer months and the southern in the winter.

The food which lures the cod towards the shore at stated periods varies with the locality and season, being

for the most part the capelin in the colder seas and the herring in the warmer; and hence the movements of these fish exert an important influence over those of the cod. At other times the chief food of the cod consists of the Invertebrates of the sea-bottom; and according to the predominance of any particular species will be its share in their maintenance. Thus in some places the cod feeds chiefly (as is shown by examination of the contents of the stomach) upon bivalve or univalve Mollusks; in others upon crabs, shrimps, and yet smaller Crustaceans; in others upon sand-stars, brittle-stars, holothurians, and other Echinoderms. The resort of cod to "banks" seems essentially determined by the food they find there; this, again, being dominated by temperature,—for, as already pointed out, the water on these banks is colder than water at the same depths elsewhere: many sub-arctic species of shell-fish, &c., which serve as food to the cod, thrive there far south of their ordinary habitats (as has been observed by Dr. J. Gwyn Jeffreys on the Dogger Bank); and thus, as Mr. Hind remarks, these banks bear the same relation to the surrounding sea area with regard to certain forms of marine life, as do the oases in the desert to various species of land animals.

An impression has prevailed among fishermen, and even among naturalists, that the Shore cod, or cod generally caught in coastal waters, is specifically different from the Bank cod, which is taken on reefs and banks in comparatively deep water, and often at a considerable distance from land. But it has been conclusively established by the careful observations of the two Profs. Sars (father and son) that no such specific distinction exists, the difference being one partly of age and partly of *habitat*. The two and three-year old cod remain on the Norwegian coast all the year round, and it is usually not until they attain their fourth year that their reproductive organs are sufficiently developed for multiplication. The adult Norwegian cod, according to Sars, retire far from the coast when the spawning season (January to March) is over; and are found during the summer on the slopes of the Polar Deep. So the cod which frequent the coasts of Labrador through a great part of the year, seem to be immature (though sometimes having their reproductive organs developed); and when they attain their full growth, which occurs in their fourth year, they change their habits, frequenting the outside banks, and only a portion of them visiting the coast during the capelin season.

According to G. O. Sars, the Norwegian cod has no regular spawning ground, but drops its spawn free in the sea at a considerable distance above the bottom. The specific gravity of the ova is slightly below that of sea-water, so that the spawn rises to the surface and floats there, unless the salinity of the surface-layer be lowered either by rain or by river-water, in which case the ova sink until they reach more saline water. The same is the case with the milt of the male, which seems to be shed at a greater depth than the roe of the female, which is thus impregnated from beneath, the micropyle of the ovum being located at its lowest point. The time required for hatching is about sixteen days, but a further period of fourteen days is required for the absorption of the yolk-bag, up to the completion of which process the young fish has little swimming power.

On the North American coast the spawning of the cod is not confined to a particular season, the process taking place in one locality or another through nearly, if not quite, every month in the year, and being obviously dominated by temperature, for it appears that cod ova find the *coldest* surface-water, provided it be free from ice, the most congenial to their development. Hence, as Mr. Hind justly remarks, the zone of cold water of from twenty-five to thirty miles broad, which extends for hundreds of miles along the Labrador coast, within the line of banks on which icebergs ground, is a most

¹ Continued from p. 172.